Teacher Participant Posting

Infusing Computer Science in Math and Science across Three Communities

Background:

Infusing Computer Science in Math and Science across Three Communities is a three-year project ***PENDING FUNDING*** from the National Science Foundation's Mathematics and Science Partnership Program. The goal of the project is to assist teachers in introducing computer science while also teaching schools' mathematics and science curricula.

Twelve middle school teachers(4 from each partner school district) from Everett, Malden, and Medford are being recruited to participate in the project.

Middle school mathematics or science teachers will receive 66 hours of professional development from August 2013 – May 2014 by participating in a graduate course and follow-up activities conducted in the partner districts. Professional development includes:

(1) 48 hours of coursework delivered by Computer Science department faculty from the University of Massachusetts Lowell (see attached syllabus); and

(2) participation in 18 hours of supplemental activities designed to assist participating teachers in the development of an inquiry-based classroom lesson based on the course content.

Participant Qualifications/Requirements:

Participating teachers must:

- attend 48 hours of classroom coursework led by the University of Massachusetts Lowell faculty (August 5–8 and 12–16, 2013 — eight total days) in one of the partner school locations TBD
- complete all course requirements including readings, homework, class participation, tests and other assignments
- participate in 18 hours of supplemental workshops, designed to assist teachers in incorporating the computer science content and inquiry-based learning experiences for students, facilitated by the district-based Teacher Learning Center Directors and UMass Lowell project staff
    - attend a district-based afterschool meeting/orientation in May 2013
    - attend a district-based callback meeting to share completed computer-infused lessons and implementation experiences
    - participate in supplemental workshops in Fall 2013 conducted in one of the partner school locations TBD
- use an electronic communication tool (Wikispaces) to collaborate with other project participants
- develop inquiry-based student lesson(s) based on the *Infusing Computer Science* course content
- implement the student lesson with a class, make lesson revisions as necessary
- participate in all required evaluation activities (surveys, classroom observations, pre/post content assessments)

Tuition

- **$50 registration deposit** upon application to reserve your space in the cohort
- **additional $245** prior to the start of the graduate course, will be paid by each teacher participant to UMass Lowell interested in receiving 3 graduate credits

Remuneration:

Each participating teacher will receive:

- **$2,310 stipend** will be paid to each participant upon the successful completion of all project activities (coursework, supplemental activities, evaluation components, lesson development and implementation) with **no** course credit
- **$1,130 stipend** will be paid to each participant upon the successful completion of all project activities (coursework, supplemental activities, evaluation components, lesson development and implementation) with **3 graduate** course credits
- **PDPs** (to be determined by the school/district)

For additional information regarding the *Infusing Computer Science in Math and Science* project, please contact Kathleen Grace, Medford TRITEC Teacher Learner Center Director at **kgrace@medford.k12.ma.us**.

Application letters must be submitted to: Superintendent Roy Belson by 2pm on **May 10, 2013**.
Please also send a copy of your application to kgrace@medford.k12.ma.us

Following the lesson plan, fellow students will be required to assess the effectiveness of both the lesson plan as well as the implementation of it (a template for this evaluation will also be developed in class).

		work	
Lesson 11	Systems-Metabolism	Energy history, cellular respiration, digestive system, aerobic/anaerobic, warm-blooded animals, metabolism, reproduction	Peanut butter sandwich, gasoline calculations, Pendulum to face, bomb calorimeter
Lesson 12	Perpetual Motion Machines	Energy needs, inventions, power sources, Solar energy, wind, geothermal, biofuels, refrigerators	Cape Wind, Photovoltaic Cells
Lesson 13	Teaching Energy Units	Group Peer Teaching	ALL students

References:

Energy: Stop Faking It! Robertson, W.C., NSTA, 2002.
Miscellaneous readings

Assignments:

Readings will be drawn from primary literature sources as well as background reading from activities. There will not be a single text although appropriate chapters of textbooks may be assigned. Participants will be required to implement at least one lesson plan/energy activity.

Evaluation:

The course grade will consist of a take-home midterm (25%), take-home final (35%), implementation of an energy lesson (20%) and active class participation (20%). Content knowledge will be emphasized on the exams. Reflection and observations of classroom experiences with lesson plans will be an important component of the latter two criteria.

Lesson Plan:

Teachers will be required to design and implement a 20-30 minute lesson plan aimed to teach one of the eight major concepts in Environmental Science. The lesson plan must follow the template for a lesson plan (this will be designed the first day of class).

Lesson 4	Heat-Modes of Heat Transfer	Latent heat of evaporation, transpiration, conduction,	Wet T-shirt Contest, How to construct a pot, Albedo, boiling water
Lesson 5	Heat-Plate Tectonics	Convection, heat transfer, tectonics, Entropy, chaos, endothermic/exothermic reactions, mixing	Lava lamps, food tectonics, hot chocolate
Lesson 6	Heat-Star Evolution	Cosmic abundance of elements, fission/fusion, gravitational collapse, E=mc2, nuclear energy	Origins of Life, search for life, supernovae
Lesson 7	Forms of Energy-Earth	Radiative budget, photosynthesis, Solar Energy, Chemical Energy, Organic Compounds Global climate change, heat transfer activation energy, hurricanes	Ecosystem flow software, DaisyWorld, Computer Simulations
Lesson 8	Forms of Energy-Rube Goldberg	Phase changes/Heat of fusion, ideal gases, chemical reactions, friction, vacuum, closed systems Electrical Energy, gases	Lighting a light bulb with a pickle, Rubbing hands with/without moisturizer, hot wheels
Lesson 9	Systems-Cycles	Carbon and water cycles, EcoSphere to Biosphere, Trophic Levels	Boiling water, Superheating water, EcoBeaker
Lesson 10	Systems-Bicycles	Gears, units and scales,	Motors

Integrating Sciences through Energy

Summer, 2013; 3 Graduate Credits

Instructors: Bob Chen, Rob Stevenson, Bala Sundaram

Location: UMassBoston—TBD

Course Description:

This course is a graduate-level science content course designed for K-12 teachers and contextualized to the standards/inquiry-based curricula. It provides graduate-level content while modeling sound pedagogy. Using current and future curriculum materials, as well as State and National standards including the new Framework and Next Generation Science Standards for the teaching of science at the K-12 level, this course offers an in-depth exploration of fundamental principles of energy as they relate to biological, physical, chemical, and earth sciences. Special emphasis will be placed on the interdisciplinary relationships among these topics so that energy can be used to integrate across the disciplinary sciences. Students will be exposed to the current state of knowledge in the scientific community through laboratory activities, outside readings, classroom presentations, and in-depth discussions with classmates. Students will participate in hands-on, inquiry based exercises drawn from National science standards-based instructional materials which will allow them to review these teaching materials and methods, as well as develop research-based strategies for communicating with students, especially English language learners and students with other special needs.

Lesson 1	Forms of Energy - Intro	Kinetic Energy, Potential Energy, Thermal energy, Gravity, work/force/motion/power	Introduction, Pre-Assessment, Rube-Goldberg Devices, dropping a ball
Lesson 2	Heat-Radiation	Radiative heat transfer, thermal time constant	Heat lamps, energy beads, coffee cups
Lesson 3	Heat-Energy Budgets	Conservation of energy, steady state, equilibrium	Light bulb, burn a peanut

Integrating Sciences Through Energy

SUPPLEMENTAL ACTIVITIES		
Workshop 1	2 hours	Pre-course meeting: Web 2.0 Skill Introduction and Development. 2 hours. This activity will occur prior to the start of the university led science course and will provide an orientation for teachers on the lesson development process, resources and tools.
Course-related inquiry-based activity development (preliminary lesson activities)	8 hours	During the university-led course delivery, teachers will begin to develop inquiry-based activities for their students, aligned with the course content. 8 hours. These activities will be developed with the support of the course K-12 co-instructors and Teacher Learning Center Directors, and content accuracy of the activities will be reviewed by the university faculty. These activities will become the foundation for the inquiry-based lessons teachers will develop for use in their classrooms. Teachers will begin to use the project Science Learning Community wiki for guidance and support.
Workshop 2	(2 hours) facilitated online	MCAS STEM Data Analysis - Curriculum Mapping. (2 hours). In this facilitated online workshop, teachers will develop curriculum mapping skills based on analysis of MCAC STEM data. The results of this analysis will be used by teachers in developing their lessons utilizing inquiry-based activities. Upon completion of this workshop, teachers will complete stage 1 type activities as described in the site-based supplemental activities section narrative (use existing web-based resources of applications).
Workshop 3	(3 hours) facilitated online	Implementing 2.0 Strategies in the Classroom. (3 hours). In this faciliated online workshop, teachers will learn about 2.0 strategies for use in their classroom, and will identify those strategies that they will use in developing their inquiry-based lessons.
Workshop 4	(3 hours) facilitated online	Science Resources for Student Investigations. (3 hours). In this facilitated online workshop, teachers will explore existing web-based content or rich internet applications (RIA) that are available free through the internet for use in their science classrooms. Teachers access to school based science resources and equipment will also be considered for use in developing student investigation skills.
Workshop 5	(3 hours) facilitated online	Formative Assessment: Developing and Using Assessment Information in Teaching and Learning. (3 hours). In this facilitated online workshop, teachers will learn how to develop formative assessment tools for use in their classrooms, to determine their students understanding and misconceptions of science content before and during their teaching of key concepts.
Workshop 6	(3 hours) facilitated online	Scientific Investigation Activities in the Classroom. (3 hours). In this facilitated online workshop, teachers will learn about and develop scientific investigation activities for their classrooms that align with the learning needs of their students and the curriculum standards for their schools. Upon completion of this workshop, teachers will have completed stage 2 type activities as described in the site-based supplemental activities section of the narrative (use existing web-based resources of applications).
Workshop 7	(5 hours) facilitated online	Lesson Development, Pilot Test and Learning Community Collaboration. (5 hours). In this facilitated online workshop, teachers will develop and implement their inquiry-based lessons in their classrooms. They will develop their lessons by obtaining feedback and sharing their learning with other teachers, K-12 and university faculty, and project staff in the online Science Learning Community environment. Teacher will implement their inquiry-based lessons in their classrooms. Upon completion of this workshop, teachers will complete stage 3 type activities as described in the site-based supplemental activities section narrative (use existing web-based resources of applications).
Workshop 8	3 hours	Callback for Lesson Development Sharing. 3 hours. In this activity, teachers will come together and share the results of their lesson development and implementation. Lessons learned and promising practices will be identified.